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QUALCOMM INCORPORATED
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EXAMINER	
SMITH, MARCUS	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/693,429	Applicant(s) WALTON ET AL.	
	Examiner MARCUS R. SMITH	Art Unit 2419	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *35-41, 43-56, 58-68, 70-71, 73-82, 84, and 85* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *35-41,43-56,58-68,70,71,73-82,84 and 85* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/03/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 43-47, 58-59 are objected to because of the following informalities: In the applicant remarks (page 1, paragraph 3), it states the applicant canceled claims 42, 57, 69, 72, and 83. However the applicant has not change the dependent claims based on claims canceled. For purpose of examining, the examiner viewed these claims will be examined as being dependent on the independent claims. Claims 43-47 will depend on claim 40, and claims 58-59 will depend on claim 55. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 35-41, 43-56, 58-68, 70-71, 73-82, 84, and 85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Paulraj et al. (US 6,351,499) in view of Shattil (US 7,317,750) and Bolourchi et al. (US 7,218,684).

with regard to claim 35, 39, 61, 64, Paulraj teaches (see figure 3):

A method of transmitting data in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

coding and modulating a first plurality of data streams to obtain a first plurality of data symbol streams (column 7, lines 10-20: S-T-coding unit, 66);

spatially processing the first plurality of data symbol streams with a first plurality of steering vectors to obtain a first plurality of transmit symbol streams for transmission from a plurality of antennas to a first user terminal in a first transmission interval (column 8, lines 34-56: transmit processing unit, 72);

coding and modulating a second plurality of data streams to obtain a second plurality of data symbol streams (column 7, lines 10-20: S-T-coding unit, 66); and

providing the second plurality of data symbol streams as a second plurality of transmit symbol streams for transmission from the plurality of antennas to a second user terminal in a second transmission interval (column 8, lines 34-56: transmit processing unit, 72).

Paulraj discloses all of the subject matter as described above except for wherein the second spatial multiplexing mode is a non-steered spatial multiplexing mode.

Shattil teaches a MIMO receiver system that performs spatially (array) processing (see figure 6b, column 19, lines 30- 50). The receiver has combiner that combines all the signals from by decoding the orthogonal poly amplitude codes. Shattil teaches the combiner can perform various adaptive combining methods, which includes a multi-user detection, null steering, spatial interferometry multiplexing and etc. (see column 26, lines 20-37). The examiner views the null steering combining method as a non steered spatial multiplexing mode.

Also Bolourchi teaches transmitting and receiving signals using the null steering technique along with beam steering method in order to improve system capacity (column 2, lines 5-16).

Shattil teaches this MIMO system to provide efficiently process a single carrier signal via multi-carrier techniques which increase bandwidth efficiencies (column 3, lines 10-20). Therefore it would have been obvious to one having ordinary skill in the art at the time invention was made to have transmitter and receiver uses null steering technique as complementary method to the beam steering method (which uses steering vectors) for spatial processing in MIMO system as taught by Shattil and Bolourchi in the system of Paulraj in order to improve system capacity and increase bandwidth efficiencies.

with regard to claim 40, 48, 67, and 70, Paulraj teaches (see figure 4):

An apparatus in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

a receive spatial processor operative to perform receiver spatial processing on a first plurality of received symbol streams in accordance with a first spatial multiplexing mode to obtain a first plurality of recovered data symbol streams (column 9, lines 24-50: receive processing block, 86), and

perform receiver spatial processing on a second plurality of received symbol streams in accordance with a second spatial multiplexing mode to obtain a second plurality of recovered data symbol streams (column 9, lines 24-50: receive processing block, 86); and

a receive data processor operative to demodulate and decode the first plurality of recovered data symbol streams in accordance with a first plurality of rates to obtain a

first plurality of decoded data streams (column 9, lines 50-67: S-T decoding unit, 88), and

demodulate and decode the second plurality of recovered data symbol streams in accordance with a second plurality of rates to obtain a second plurality of decoded data streams (column 9, lines 50-67: S-T decoding unit, 88).

Paulraj discloses all of the subject matter as described above except for wherein the second spatial multiplexing mode is a non-steered spatial multiplexing mode.

Shattil teaches a MIMO receiver system that performs spatially (array) processing (see figure 6b, column 19, lines 30- 50). The receiver has combiner that combines all the signals from by decoding the orthogonal poly amplitude codes. Shattil teaches the combiner can perform various adaptive combining methods, which includes a multi-user detection, null steering, spatial interferometry multiplexing and etc. (see column 26, lines 20-37). The examiner views the null steering combing method as a non steered spatial multiplexing mode.

Also Bolourchi teaches transmitting and receiving signals using the null steering technique along with beam steering method in order to improve system capacity (column 2, lines 5-16).

Shattil teaches this MIMO system to provide efficiently process a single carrier signal via multi-carrier techniques which increase bandwidth efficiencies (column 3, lines 10-20). Therefore it would have been obvious to one having ordinary skill in the art at the time invention was made to have transmitter and receiver uses null steering technique as complementary method to the beam steering method (which uses steering

vectors) for spatial processing in MIMO system as taught by Shattil and Bolourchi in the system of Paulraj in order to improve system capacity.

with regard to claim 49, 54, 55, 73, 77, Paulraj teaches (see figure 3):

A method of transmitting data in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

receiving information indicating a spatial multiplexing mode and a plurality of rates to use for data transmission, wherein the spatial multiplexing mode is selected from among a plurality of spatial multiplexing modes supported by the system, and wherein each of the plurality of rates is selected from among a set of rates supported by the system (column 7, lines 40-56: adaptive controller, 60);

coding and modulating a plurality of data streams in accordance with the plurality of rates to obtain a plurality of data symbol streams (column 7, lines 10-20: S-T-coding unit, 66); and

spatially processing the plurality of data symbol streams in accordance with the spatial multiplexing mode to obtain a plurality of transmit symbol streams for transmission from a plurality of antennas (column 8, lines 34-56: transmit processing unit, 72)

Paulraj discloses all of the subject matter as described above except for wherein the second spatial multiplexing mode is a non-steered spatial multiplexing mode.

Shattil teaches a MIMO receiver system that performs spatially (array) processing (see figure 6b, column 19, lines 30- 50). The receiver has combiner that combines all the signals from by decoding the orthogonal poly amplitude codes. Shattil

teaches the combiner can perform various adaptive combining methods, which includes a multi-user detection, null steering, spatial interferometry multiplexing and etc. (see column 26, lines 20-37). The examiner views the null steering combing method as a non steered spatial multiplexing mode.

Also Bolourchi teaches transmitting and receiving signals using the null steering technique along with beam steering method in order to improve system capacity (column 2, lines 5-16).

Shattil teaches this MIMO system to provide efficiently process a single carrier signal via multi-carrier techniques which increase bandwidth efficiencies (column 3, lines 10-20). Therefore it would have been obvious to one having ordinary skill in the art at the time invention was made to have transmitter and receiver uses null steering technique as complementary method to the beam steering method (which uses steering vectors) for spatial processing in MIMO system as taught by Shattil and Bolourchi in the system of Paulraj in order to improve system capacity.

with regard to claims 81 and 84,

An apparatus of receiving data in a wireless multiple-input multiple-output (MIMO) communication system, comprising:

means for receiving information indicating a spatial multiplexing mode and at least one rate to use for data transmission, wherein the spatial multiplexing mode is selected from among a plurality of spatial multiplexing modes supported by the system, and wherein each of the at least one rate is selected from among a set of rates supported by the system (column 10, lines 47-65);

means for spatially processing at least one received symbol stream in accordance with the spatial multiplexing mode to obtain at least one recovered data symbol stream (column 7, lines 10-20: S-T-coding unit, 66); and

means for demodulating and decoding the at least one recovered data symbol stream in accordance with the at least one rate to obtain at least one decoded data stream (column 9, lines 50-67: S-T decoding unit, 88).

Paulraj discloses all of the subject matter as described above except for wherein the second spatial multiplexing mode is a non-steered spatial multiplexing mode.

Shattil teaches a MIMO receiver system that performs spatially (array) processing (see figure 6b, column 19, lines 30- 50). The receiver has combiner that combines all the signals from by decoding the orthogonal poly amplitude codes. Shattil teaches the combiner can perform various adaptive combining methods, which includes a multi-user detection, null steering, spatial interferometry multiplexing and etc. (see column 26, lines 20-37). The examiner views the null steering combing method as a non steered spatial multiplexing mode.

Also Bolourchi teaches transmitting and receiving signals using the null steering technique along with beam steering method in order to improve system capacity (column 2, lines 5-16).

Shattil teaches this MIMO system to provide efficiently process a single carrier signal via multi-carrier techniques which increase bandwidth efficiencies (column 3, lines 10-20). Therefore it would have been obvious to one having ordinary skill in the art at the time invention was made to have transmitter and receiver uses null steering

technique as complementary method to the beam steering method (which uses steering vectors) for spatial processing in MIMO system as taught by Shattil and Bolourchi in the system of Paulraj in order to improve system capacity.

With regard to claims 36, 62, 65, Paulraj also teaches: deriving the first plurality of steering vectors such that the first plurality of data streams are transmitted on a plurality of orthogonal spatial channels of a first MIMO channel for the first user terminal (column 10, lines 15-30).

With regard to claims 37, 63, and 66, Paulraj also teaches: coding and modulating a third plurality of data streams to obtain a third plurality of data symbol streams (column 7, lines 10-20: S-T-coding unit, 66); and spatially processing the third plurality of data symbol streams with a second plurality of steering vectors to obtain a third plurality of transmit symbol streams for transmission from the plurality of antennas to a plurality of user terminals in a third transmission interval (column 8, lines 34-56: transmit processing unit, 72).

With regard to claim 38, Paulraj also teaches: deriving the second plurality of steering vectors such that the third plurality of data streams are received with suppressed crosstalk at the plurality of user terminals (column 10, lines 15-30).

With regard to claims 41, 50, 56, 68, 71, 74, 78, 82, and 85, Paulraj also teaches: wherein the first spatial multiplexing mode is a steered spatial multiplexing mode, and wherein the first plurality of received symbol streams are spatially processed with a plurality of eigenvectors for a plurality of spatial channels of a MIMO channel for a user terminal (column 11, lines 1-15).

With regard to claims 53, 76, and 80, Paulraj also teaches: further comprising: performing calibration so that uplink channel response is reciprocal of downlink channel response (column 10, lines 56-65).

With regard to claims 43, and 59, Shattil also teaches: wherein the second plurality of decoded data streams are estimates of a plurality of data streams transmitted by a single user terminal (column 19, lines 48-55, it specifies that channel estimation of transmitted symbols by at least user, but it also channel estimation with multi users since it's a multi-carrier system.)

With regard to claim 44, Shattil also teaches: wherein the second plurality of decoded data streams are estimates of a plurality of data streams transmitted simultaneously by a plurality of user terminals (column 19, lines 48-60: in lines 50-51, it specifies the receiver (column 19, lines 48-55, it specifies that channel estimation of transmitted symbols by at least user, but it also channel estimation with multi users since it's a multi-carrier system.).

With regard to claims 45, and part of 58, Paulraj also teaches: wherein the second plurality of received symbol streams are spatially processed based on a channel correlation matrix inversion (CCMI) technique (column 8, lines 1-10).

With regard to claims 46, and part of 58, Shattil also teaches: wherein the second plurality of received symbol streams are spatially processed based on a minimum mean square error (MMSE) technique (column 26, lines 1-10).

With regard to claims 47, part of 58, Shattil also teaches: wherein the second plurality of received symbol streams are spatially processed based on a successive interference cancellation (SIC) technique (column 26, lines 25-30).

With regard to claim 51, Shattil also teaches: transmitting a steered pilot on each of the plurality of orthogonal spatial channels (column 19, lines 60-67).

With regard to claims 52, 75, 79, Shattil also teaches: wherein the plurality of data symbol streams are provided as the plurality of transmit symbol streams (column 25, lines 1-12).

Response to Amendment

4. The amendment filed on 11/12/08 is sufficient to overcome the Paulraj reference.

Response to Arguments

5. Applicant's arguments with respect to claims 35-41, 43-56, 58-68, 70-71, 73-82, 84, and 85 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MARCUS R. SMITH whose telephone number is (571)270-1096. The examiner can normally be reached on Mon-Thurs: 7:30 am - 5:00 p.m. and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wing Chan can be reached on 571 272-7493. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MRS 1/27/09

/Wing F. Chan/
Supervisory Patent Examiner, Art Unit 2419
1/28/09